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Domestic State Papers.

Message from the President of the United States, transmitting a report of the examination which has been made by the Board of Engineers, with a view to internal improvement, &c.

(Continued.)

These levels being all below the base-mark, proved, that whichever summit level we adopt, we must elevate the waters of the two Youghiogenies, by throwing great dams across them. The height of these dams would be lower, and a less quantity of lockage required, if we dropped the summit level of the Youghiogeny route; but the length of the tunnel from Crabby's arm, and deep cutting at each of its extremities, would then be proportionably augmented. For the sake of comparison, we have, therefore, supposed those two routes on a level, a passage was sought to open a communication between Deep Creek and the Great Youghiogeny, through the opposite valleys of Indian run and Cranbury run. But, as the sources of these runs rise 226 feet above the base-mark, and the Youghiogeny at the Indian run lies 70.50 feet below it, a dam across the Youghiogeny, and a tunnel through the Roman Nose ridge, would both be indispensably required to accomplish this object.

An attempt was also made to lead Muddy Creek, which, from the west, falls in the Youghiogeny, to the summit level of these routes. But to lead it to the summit level of the Deep Creek route, it would be necessary to conduct it by a long aqueduct upwards of 140 feet high, and to lead it to that of the Youghiogeny, to run a feeder upwards of 30 miles, before it reached the mouth of Indian run, and which would absorb, by filtrations and evaporation, during its course, most of the water which it would receive. Aqueducts through the ravines which it should wind round, would shorten it: but a greater number of them would be required, and heir constructio n would be very costly.

To ascertain the relative levels of Pine Swamp (where rise the springs of Muddy Creek of Youghiogheny, and Muddy Creek of Cheat river) and Deep Creek, a level was run to the summit of the ridge, which divides the waters of the Youghiogheny and Cheat river; this ridge parallel to the Roman Nose ridge, is called Snaggy Mountain. From this level, it appeared that the point, from which rise the highest springs of the two muddy creeks, is 75 feet above Pine Swamp, and 226.77 feet above the base-mark. This result, which proved the impossibility of running the canal in this direction from the mouth of Deep Creek, proved also that a reservoir of three or four miles area might be formed in the Pine Swamp, and that being raised at least 150 feet above the base-mark, a feeder might be led from it, following the eastern ridge of Snaggy Mountain, and joining Suowey Creek, after winding round the heads of the tributaries of the Youghiogheny, from Snowey Creek to Muddy Creek. This feeder would be from eight to twelve miles long, and to form the reservoir a dam might be thrown through Muddy Creek of the Youghiogheny, at the gap where it breaks through Snaggy Mountain. This reservoir would afford an important supply, if those of the little and great Youghioghenies should prove insufficient to feed the summit levels. We shall now enumerate and measure the capacity of these several reservois, and give all the necessary details of them.

Reservoir No. 1, might be formed in the main branch of the great Youghiogheny, by throwing a dam across it, above the mouth of Cherry-tree Creek. It should be forty feet high to raise the water six feet above the summit level, and allow to the feeder a descent of six inches per mile—height of its dam forty feet, and length of its feeder, to the dam in Deep Creek 16 miles.

Area of the reservoir, exposed to evaporation, 2,894,333 sq. yds.
Its prism, or capacity of water, above the base-mark, 5,523,370 cub. yds

No. 2 might be formed in Cherry creek by throwing a dam across it, above its mouth; the dam should be 40 feet high, and the length of its feeder 16 miles. For this, and all the following reservoirs, we shall allow the same data, six feet water above the base-mark, and six inches descent per mile for their feeders.

Area 1,752,000 sq. yds.
Prism 3,170,148 cub. yds.

No. 3 might be found in Youghiogeny, between Cherry and Snowy creek, by throwing a dam through it, above the mouth of Snowy creek. Height of the dam 50 feet, length of the feeder 14 miles.

Area 1,475, 444 sq. yds.
Prism 2,796, 518 cub. yds.

No. 4 receiving Laurel creek and Snowy creek, might be formed by throwing a dam across the latter, above its mouth. Height of its dam 50 feet, length of its feeder 14 miles.

Area 3,444, 444 sq. yds.
Prism 6,536, 666 cub. yds.

No. 5 might be formed in the great Youghiogeny, between Snowy creek and the little Youghiogeny, by throwing a dam agross it above the mouth of the little Youghiogeny. Height of the dam 67 feet, length of the feeder 10½ miles.

Area 2,233, 632 sq. yds.
Prism 5,555,555 cub. yds.

No. 6 might be formed in the little Youghiogeny, by throwing a dam across its mouth. Height of the dam 67 feet, and length of the feeder 11 miles.

Area 58, 875 sq. yds.
Prism 106,750 cub. yds.

No. 7 might be formed in Dunker's lick, by throwing a dam across it, above its mouth. Height of the dam 75 feet, and length of the feeder nine miles.

Area 1,055,555 sq. yds.
Prism 1,851,851 cub. yds.

No. 8 might be be formed in the great Youghiogeny, between the mouth of the little Youghiogeny, and the ledge, by throwing a dam across the ledge. Height of this dam 94 2-3 feet, length of the feeder 6¼ miles.

Area 2,770,666 sq. yds.
Prism 5,303,555 cub. yds.

Areas of all the reservoirs 16,279,149 sq. yds.
Prisms do 30,844,413 cub. yds.

If we dispense with the two last reservoirs, whose dams are the highest and most expensive, the 5 remaining reservoirs above the mouth of the little Youghiogeny will contain--Area exposed to evaporation, 12,452,928 square or 4 2-100 square miles, or 2,572 80-100 acres. Prism of their waters, 6 feet above the base-mark, besides 6 inches allowed per mile of the length of the feeder of each reservoir for its descent. These are all available to supply the summit level 23,689,007 cubic yards.

These reservoirs are all independent of one another and the higher ones may pour the surplus of their waters into the lower ones. Those numbered 3, and 5, in the great Youghiogeny, may be regarded as one, to which all the others can contribute when circumstances require it. The dam No. 3 might even be suppressed, which would reduce the No. of dams to 5. But the proper location of these dams, as also their number and dimensions, will receive further investigation, which belong to the final project; their number will likely be reduced.

As to the total quantity of water which these basins might hold, if we suppose their main depth 16 yards, and a middle horizontal section run between the surface and bottom, equal in area to one half of the upper surface, or to 6,226,464, square yards, (half of 12,452,928 square yards,) it will amount to 99,623,424 cubic yards, or, in round terms, 100,000,000 cubic yards.

As to the time necessary to fill them, from observations taken with care, from 1817 to 1824, (inclusively) by Mr. Lewis Brantz, in the vicinity of Baltimore, Md. we have the following results:—in the course of eight years, from 1817 to 1824, there fell, on a mean average, yearly 39 89-100 inches. In 1822 there fell the smallest quantity, the summer was very dry, vegetation deficient, the crops of grain were short. The quantity of rain which fell that year was 29.20 inches. The greatest quantity which fell was in 1817, it amounted to 48.55 inches. Applying these data to the country round the summit level, and using only the results of the year 1822, the rain which fell in the three first and three last months of this year amounted to 16.70 inches, whilst that which fell in the same months of the year 1817 amounted to 18.40 inches. These 16.70 inches are equivalant to 0.465 cubic yards. Thus during the three

first and last months of each year, there will fall at least 0.46 cubic yds. of rain on each square yard of the heads of the Youghiogeny, and an area of 217,391,304 square yards would be required to collect water for filling the 100,000,000 yards of the reservoirs. This area amounts to 70 18-100 square miles; and the area of the valleys of the two Youghiogenies, above their junction, and the surface of the reservoirs, amounts to much more. Besides, the heads of Cheat river could, perhaps, be brought to feed the reservoirs. These reservoirs once filled, the mass of waters which lies lower than the head of the feeders, will never alter, and the upper part, which feeds the summit level, will alone require to be renewed every year. We have seen that it contains 23,689,007 cubic yards.

The least quantity of water which the great Youhiogeny gave in 1824, under the bridge on the road from Manfield to Morganstown, was, on the 21st September, 22.58 feet in a second. The little Youghiogeny gave, on the 20th September, 1824, at Germian bridge, 4.30 feet. Total given by those two streams, in a second, at their lowest stage, 26.88 feet.

This is the minimum which they can give to supply the reservoirs. In one month it would amount to 2,580,480 cubic yards; and, supposing what is most unlikely, that the two Youghiogenies and their tributaries should remain in this state, and give no more for six months, from May to October, it would supply the reservoirs with 15,482,880 cubic yards; and, as during the six preceding months, they would have received much more, they would be full at the opening of navigation, and receive every month at least 2,580,480 cubic yards as regular tribute.

We do not consider in this calculation the loss by filtration and evaporation: for, by raising the dams of the reservoirs, a quantity of water would be added to them, which would overbalance it.

We must now compare those supplies, the minimum of what the heads of the two Youghiogenies can furnish with the maximum of what either of the two summit levels will require.

They will both require the same expense of water for lockage. We know that two lockfulls is the maximum expense for raising or lowering a boat, and eight minutes are required for its passage through a lock of 30 yards in length, 5½ yards in breadth, and 2 2-3 yards in lift. Such a lock will contain 428.64 cubic yards, without deducting from it the draught of water of the boat, and its passage (at the maximum) will thus consume 853.32 cubic yards, or 854 cubic yards at most. Now, if the canal is navigated nine months, or 270 days a year, at ten hours a day, and that the locks of the summit level be kept in constant operation all that time, they might pass, allowing eight minutes for each boat, 20,250 boats, at an expense of water equal to 17,293,500 cubic yards, for the nine months, or 1,921,500 cubic yards a month. This maximum of water for the expense of lockage, is 658,980 cubic yards less than the minimum which the reservoirs will receive during that time.

The expense of water for lockage being 17,293,500 cubic yards, and the reservoirs containing 23,689,007 cubic yards, there will remain in reserve to supply the losses of the summit level, from filtrations and evaporation, 6,395,507 cubic yards.

The summit level of Deep Creek, extending 11¼ miles in length, will require 413,600 cubic yards to fill it; and, supposing that it loses by filtrations and evaporation the value of its prism every month, or nine times in the year, it will expend 3,722,400 cubic yards. The profile of its feeder having a supposed area of 10 square yards, and a length of 10½ miles, it will consume, at the same rate, 1,663,200 cubic yards. Total consumption for nine months, 5,385,600 cubic yards. Retrenching this quantity from the surplus mass of the reservoirs, there will still remain 1,009,907 cubic yards, which, after supplying all the waste of lockage, and the losses of the summit level from filtrations and evaporation, will serve as an additional supply to repair those of the eastern and western branches of the middle section.

The Youghiogeny summit level, extending 21 miles in length, will lose from filtrations and evaporation, on on the same principle, 739,200 cubic yards a month, (the value of its prism) and 6,652,800 cubic yards in nine months. It would thus absorb the whole surplus mass of the reservoirs, after the waste of lockage, and

require a much greater expenditure of water than the Deep Creek summit level.

Thus the important advantage of a greater supply of water, by a length shorter by nine miles, of a tunnel shorter by two and a half miles, render the Deep Creek route superior to the other; though the final surveys only can settle that point, yet at this stage of our operations we would recommend that route in preference. However, the analysis which we have just concluded, is a convincing proof that a canal by either of these routes over the chain of the Alleghanies, between the mouths of Savage River and Bear Creek, is perfectly practicable. The total distance from the mouth of Savage River to that of Bear Creek, will be forty-one miles at least, the rise from the mouth of Savage River to the base-mark, 1,432 feet; and the fall from the base-mark to the mouth of Bear Creek, 956 35-100 feet, total of lockage, 2,388 35-100 feet.

The preparatory surveys executed on this middle section were performed by Captain M'Neill, of the United States' Topographical Engineers, and Mr. Shriver, Assistant Civil Engineer, employed by the United States. The talents and activity displayed by these gentlemen and their assistants, enabled the Board to collect the facts on which they rest their opinion of the practicability of this middle section, and of the best direction through which its route can be directed.

Captain M'Niell was assisted in these labours by Messrs. De Russy, Cock, Trimble, Hazard, Dillahunty, Fessenden and Williams, Lieutenants of Artillery, whose scientific education, imbibed in the academy at West Point, was thus made valuable in the most efficient and useful manner, to their country and to themselves. Mr. Shriver was assisted by Messrs. Jonathan Knight, John S. Williams, Freeman Lewis and Joseph Shriver. The memoirs, surveys, and maps, of these gentleman, accompany this report.

Before we conclude the article relating to this middle section, we should give an analysis of two other routes which have been proposed for leading the canal over the Alleghany; the one by ascending Will's Creek, (a stream which falls in the Potomac at Cumberland) and descending to the Youghiogeny, by the valley of Casselman's River; the other by passing from the valley of the Potomac to that of Cheat River, and thus descending to the Monongahela.

1st. Two of the head springs of Will's Creek rise very near Flaherty Creek, which falls in Casselman's River, below Salisbury; the eastern is called Laurel Run, and the other Shock's Run. The shortestd istance between Long Run and Flaherty Creek, is one mile 756 yards. It was measured from Wilhelm's saw mill, on Laurel Run, to Engle's saw mill on Flaherty Creek. The first is 156 feet lower than the second. A deep cut of 333 yards long, and 35 feet deep, in the highest part of it, on the side of Engle's saw mill, a tunnel of 1,485 yards, and another deep cut, 700 yards long, and of the same depth as the former, on the side of Laurel Run, would be required to unite those two streams. The greatest height of the ridge above the bed of the tunnel, would be 156 feet. This route offers great advantages, if we only considered the shortness of the distance and tunnel, but as to the essential condition of a sufficient supply of water, it is absolutely out of the question. Flaherty Creek, at Engle's mill, gives only 0.415 cubic feet in a second, and Laurel Run, at Wilhelm's mill, 0.600 cub. ft.—(at their lowest stage in 1824.) They would only give, together, 1.015 cub. ft. per second, to feed the whole summit level. The details which we have already given in analysing the Deep Creek route, and summit level, are sufficient to show the impracticability of receiving a canal by the route of Flaherty's Creek, with so small a supply of water.

As to the route between Shock's fork and Flaherty's creek, the season was too advanced to measure accurately its length, or the tunnel and deep cuts which it would require. Their profile will be surveyed next season. This route would be longer than the other, and its summit level should be fed by the waters of Casselman's River above Salisbury, lead by a feeder to the western extremity of the tunnel. This feeder, following the eastern side of Casselman's valley, would receive the waters of its tributaries between Salisbury and Flaherty's Creek. At their lowest stage these tributaries gave, altogether, five feet in a second, and Casselman's River above Salisbury, 15.33 cubic feet; total 20.33 cubic feet to feed the summit level. This quantity is not considerable when we consider, that, on a length of thirty miles from the summit level to Cumberland, the canal would have to draw most of its water from Casselman's River: for Will's Creek is a torrent, which, in the greatest part of its course, gives but little water in summer.

The length of this summit level, and of the route which the canal would thus trace, are less than by deep Creek. As to their comparative heights, no survey was made in the season of 1824, to ascertain the difference. We shall now expose the reasons why the western branch of the canal was not led through the valley of the Monongahela (before concluding this part of our report.)

We have already seen that the valley of Cheat River, through which it would be necessary to pass to the Monongahela, is divided from the Upper Youghiogeny by a ridge whose greatest depression, at the head of the two muddy Creeks, is 226.77 feet above the level of the base mark. A tunnel would, therefore, be necessary to pass from the valley of the Youghiogeny to that of Cheat River.

A single inspection of the map will show that the route of the canal would be very much lengthened by running its summit level from the heads of the north branch of the Potomac to those of Cheat River, and that it should be raised to a much higher level than on the route of Deep Creek. There is every reason to believe that the bed of Cheat River has a more rapid descent than that of the Youghiogeny, and that, where it forces through the Laurel Hill, it is already nearly on a evel with the Youghiogeny at Connellsville: for, at this gap, and a little above Furnace Run, it begins to be navigable. Its bed is here about 150 yards wide.

The highest floods in Cheat River do not rise above eight or ten feet at Furnace Run, and at its lowest stage in August and September, it is very low at this place, and often fordable. Indeed, Cheat River, to its junction with the Monongahela, receives no stream of any importance but the Big Sandy, whose supply is constant, but in the summer, is very trifling, even towards its mouth in the lower part of its course. After descending along a rocky and very precipitious bed, Cheat River mingles its clear and limpid waters with the muddy stream of the Monongahela, whose bed and shores are all formed of alluvial soil.

The Monongahela has absolutely the same features as the Ohio: its shores are flat, but raised perpendicularly along both sides of the river to the height of fifteen or twenty-five feet above the line of water, formed of a rich alluvial soil; they are corroded by the current, and when the river rises they crumble into it, and renders its waters muddy. The floods of the Monongahela are considerable; at Brownsville it rises thirty-eight feete whilst, at its lowest stage, its depth is only from twelv to fiteen inches on its highest bars. The two bank present all along a succession of flats and bluffs; the flats of one bank are generally opposite to the bluffs of the other, and the former are found where the river expands, whilst the latter close on its banks where it narrows. The chief tributaries of the Monongahela are on its right shore, George's Creek, below Mr. Gallatin's residence, Big Redstone, below Brownsville; and on the left, Ten Mile Creek. These streams flow constantly, but in summer give but a small quantity of water, an observation which is also applicable to many of the tributaries of the Youghiogeny.

If the western section of the Chesapeake and Ohio Canal cannot be led to the Monongahela, it will at least embranch with it at M'Kee's port, and perhaps when a denser population will render it desirable, a line of junction may be drawn between Cheat River and the valley of the Youghiogeny. It would be fed by a reservoir above the gap of Cheat River, and the constant springs which run from the western ridge of Laurel Hill.

Western Section.

This section begins at the mouth of Bear Creek, and sends at Pittsburg, descending the valleys of the Youghiogeny and Monongahela to the Ohio.

From the mouth of Bear Creek to that of Casselman's River, the Youghiogeny runs in a very winding course between a succession of flats and bluffs, the flats of one shore being generally opposed to the bluffs of the other, the banks high and rugged where they wind in, and flat where they wind out. The two banks present nearly the same difficulties; the right shore, however, seems the best. The distance between those points, following the winding of the river, is about 16 1-2 miles.

Casselman's river is about 100 yards wide at its mouth; it is a fine river, and will give a great deal of water to the canal. At the dryest season it offers from eight inches to one foot in depth; before joining the Youghiogeny, it receives Laurel Hill creek.

From the mouth of Casselman's River, till you reach two or three miles above Connellsville, the Youghiogeny forces through Briery Mountain and Laurel Hill, and its bed is very deep. The left bank is very high and rugged, the right somewhat less. In this space of about 28 1-2 miles, the canal must be frequently cut in a shelf on the sides of the valley, or run on embankments supported by a wall. The river has a fall of about sixteen feet at Ohiopyle falls; it is here about 150 yards wide.

Connellsville is considered as the head of navigation in the Youghiogeny. In the dryest season, it has here from eight inches to one foot in depth.

From Connellsville to Robstown, the river winds during twenty-four or twenty-five miles: on all this extent, the right bank is far preferable to the other. Except in three or four places, where you meet with bluffs, it consists of flats or gentle slopes, where the canal can be run without difficulty. As to these bluffs, they consist of schistose rock, easy to work. The only stream of any importance which joins the Youghiogeny between Connellsville and Robstown, is Jacob's Creek, and it gives but little water in dry seasons. That route is also intercepted by two or three deep ravines, which the canal must cross on aqueducts.

The distance between Robstown and M'Kee's port is about sixteen miles. Along this route the right shore remains preferable to the other; it consists of a succession of flats and spurs, which being of a schistose nature and moderate height, will offer no considerable obstructions to the canal.

From M'Kee's port to Pittsburg, the right shore of the Monongahela offers a most favourable ground, except along two spaces of about a mile each, where rugged bluffs close on the river. The first is below Judge Wallis' and the field of Braddock's defeat; the second before reaching Pittsburg. The whole distance, in following the right bank of the river, is between M'Kee's port and Pittsburg, from fifteen to sixteen miles.

The highest floods of the Youghiogeny occur between Casselman's river and Connellsville—they rise to eighteen feet. At Connellsville they rise from twelve to fifteen feet. Salt wells may be dug in its valley coal and iron are abundant; and excellent materials for building, timber, and stone, are found all along it.

The preparatory surveys of this western section were not commenced during the last season (1824.) They can alone fix the general route of the canal: they will be directed on the following bases:

From Bear creek, the canal must follow the right shore of the valley, descending along the Youghiogeny: and though it is most favourable, (presenting a rugged bank only for four or five hundred yards) when it reaches Selby's port bridge, two lines of direction may be tried, one along the right, and the other along the left bank, to the old salt works. The depth and breadth of the valleys and ravines, which it will be necessary to cross on aqueducts, will be measured, and the location of these aqueducts, and of the dams to form reservoirs, will be fixed.

If, between Selby's port and the old salt works, the left shore presents any advantages over the other, deserving the expense and trouble of crossing twice the Youghiogeny, the location and dimensions of two aqueducts, one at Selby's port, and one above the old salt works, will be determined, and a feeder led from Casselman's river to the latter.

From the old salt works to the Ohiopyle falls, the canal must follow the right shore, which is most favourable, and then crossing Indian creek, on an aqueduct, continue along the same bank to the paper mill four or five miles south of Connellsville. It will be proper to ascertain whether its line should not leave the valley of the Youghiogeny, above the Ohiopyle falls, and running east, gain the southern branch of Indian creek, to rejoin the Youghiogeny by descending Indian Creek valley.

From the paper mill, the canal should be run at a sufficient elevation above the river, to leave the shore, and gain, if possible, the high level which lies east of

Connellsville, in order to turn round the rugged bluff below that place. From thence, following the right shore, it will reach Robstown, after crossing on aqueducts Mount's creek and Jacob's creek. The localities and dimensions of these aqueducts must be determined, as well as the resources which these streams may afford to supply the canal, by turning them into reservoirs.

From Robstown to M'Kee's port, keeping along the right shore, it must cross Sewickly creek over an aqueduct, whose dimensions and location must be determined. As this creek has two considerable branches, they must be examined, to determine whether reservoirs cannot be made in them.

From M'Kee's port to Pittsburg, the canal will follow the right shore of the valley of the Monongahela, crossing in succession, Crooked Run, Turtle Creek, and Nine Miles Run, on aqueducts.

To ascertain whether from Paper Mill the right shores of the Youghiogeny and Monongahela are certainly the best, a level should be run along their valleys on the left shore, and the locations and dimensions of the dams or aqueducts which it would be necessary to run through the Youghiogeny at M'Kee's port, and through the Monongahela near its confluence with the Youghiogeny, in case this route was adopted, should be fixed and calculated.

It will also be essential to try whether the canal might not turn to the west of that narrow and rugged portion of the valley of the Youghiogeny, where it forces its way through Briery Mount and Laurel hill. For this purpose, a level should be run from Selby's port, and some point of a proper elevation, and cross the Briery Mount at the depression which it offers between the heads of Buffalo Marsh Run and the eastern branch of Sandy Creek. This level should then wind round the ravines of the head of the western branch of Saudy Creek, till it met the Laurel Hill at the spot where it might be crossed by the shortest tunnel. When it reached its western slope, it should run northwardly along its font to descend by one of its ravines to the Youghiogeny, opposite the paper mills.

On the whole, the western section of the canal, from the mouth of Bear Creek to that of the Monongahela, at Pittsburg, offers no obstacles which may not be surmounted at a reasonable expense; and the waters of the Youghiogeny, Bear Creek, and Casselman's river, are amply sufficient to feed it. Large reservoirs may be formed in Bear creek and Casselman's river, by throwing dams across them, and on the route from Casselman's to the Paper Mills, and at the mouth of the Youghiogeny in the Monongahela. The practicability of this section is out of question.

Its length will be about 100 miles, and its descent from Bear creek to Pittsburg 584½ feet, as Pittsburg is 756 feet above the level of the ocean.

The investigation of the topography and water courses of the country, through which the Chesapeake and Ohio Canal should run, and the results of our preparatory surveys, obtained up to the present moment, demonstrate that this noble enterprise is practicable; and although we have not yet sufficient data to calculate the expense of the work, there is every probability that it will not bear any comparison with the political, commercial, and military advantages which it will procure to the Union.

The total result of the length, rise, and fall of the canal, is as follows:

Total Length.

	miles.
From the tide water in the Potomac to Cumberland, (from Messrs. Moore and Briggs's survey,)	182
From Cumberland to the mouth of Savage river, (from Major Abert, U. States' Topographical Engineer's survey,)	27½
From the mouth of Savage river to that of Bear creek, by the Deep creek route, from the surveys of Captain M'Neil, United States' Topographical Engineer, and Mr. Shriver, United States' Assistant Civil Engineer,	41
From the mouth of Bear creek to Pittsburg, (from Mr. Shriver's computation,)	100
	350½

Total Rise.

	feet.
From tide water in the Potomac to Cumberland, (from the profile of Cumberland road,)	537
From Cumberland to the mouth of Savage river, (from Major Abert's survey,)	327½

From the mouth of Savage river to the Base mark, on the Deep creek summit level, (from Capt. M'Niell's survey,)	1,432
	2,296½

Total Descent.

From the Base mark to the mouth of Bear creek	956
From thence to the Ohio, at Pittsburg	584½
	1,540½
Total lockage for rise and descent	3,837

OHIO AND ERIE CANAL.

(See Map, No. 17.)

This canal may be divided in two sections: 1st, the Southern, beginning at Pittsburg, and terminating at the summit level which divide those waters that pay their tribute to the Ohio from those which pay it to Lake Erie. 2d, The Northern, beginning at that summit level, and ending in Lake Erie.

SOUTHERN SECTION.

It should follow the right shore of the Ohio, from Pittsburg to the mouth of the Big Beaver, ascending the valleys of that river, and one of its heads, till it reaches the summit level.

From Pittsburg to the mouth of Big Beaver, the river winds for about thirty miles. Its right shore is formed of successive bluffs and bottoms; the latter generally form two beds parallel to the river, and rising one above the other, as if the bed of the river had formerly been higher than it is at present. The upper bottom is never overflowed, and both are formed of an alluvial soil, most favourable for digging a canal. The bluffs consist of a schistose and clayey soil, which is easy to excavate; nor do they offer any considerable steep ground, except four miles below Pittsburg, on a length of four miles. The left shore possesses no advantages over the other, and offers the same features, the bottom of one shore generally lying opposite to the bluffs of the other. No stream of any importance joins the Ohio, from Pittsburg to the Big Beaver; but the river presents, in that interval, eighteen bars, which have but ten or twelve inches of water in the dry season. At Pittsburg, its floods rise from 22 to 24 feet.

The Big Beaver, from its mouth in the Ohio, to the forks of Mahoning and Shenango, presents, like the Ohio, two flat bottoms on each of its shores; they both consist of a succession of bottoms and bluffs; the former offering a most favourable ground, and the latter consisting of a schistose and clayey soil, presenting no serious obstacle to the digging of a canal, except on the left shore at the spot where it joins the Ohio. This bluff is almost perpendicular, and consists of a mixture of clay and gravel.

The floods of the Big Beaver rise from eight to nine feet; and sometimes those of the Ohio back its course; it then rises and presents a level surface from the foot of the falls. These begin five or six miles from its mouth; their total descent is fifty-one feet. From the mouth of the river to the forks of Mahoning and Shenango, its course winds about twenty miles. It receives no tributary of any importance, nor presents any ravine considerable enough to require an aqueduct for the canal in all this space.

The Mahoning and Shenango are the two upper forks of the Big Beaver. The first descends from the neighbourhood of Warren, and rises west of this place, on the east side of a ridge which divides its waters and those of Grand river, from those of the Cuyahoga. The Mahoning, as well as the Shenango, has but a small current in the summer season, their beds are seldom more than 40 or 50 yards wide, and their depth at that time seldom passes 5 or 6 inches.

The Mahoning receives no stream of any importance; Musquito creek, which joins it on the left

shore, below Warren, is often dried up in summer. The Shenango receives on its right shore the Pymatuning, which is not entirely dried up at its lowest stage. The two forks of the Shenango join at Greenville; the western fork is called Shenango creek, and the eastern, Little Shenango; the latter receives on its right bank, Crooked creek, Musquito creek, the Pymatuning, Shenango creek, and Crooked creek, all rise in the swampy ground which here divides the waters which fall into the Ohio, from those which join Lake Erie. The head of Shenango creek, and Crooked creek, cross also the Pymatuning swamp to the W. of Conneaught lake. At Greenville, the floods of the Shenango rise from 8 to 10 feet.

From the mouth of Mahoning to Warren, the distance is about 26 miles, in following its windings.—As to the nature of its valley, its banks are generally flat, and favourable for digging a canal, as well as those of the Shenango, and of its tributary the Pymatuning.

In following from W. to E. the ground which divides the heads of the Big Beaver from the tributary streams of Lake Erie, it descends from Cuyahoga to Champion township, and ascends towards French creek. Champion Swamp is thus the lowest part of this level; its elevation above Lake Erie, from a survey of Mr. Geddes, is 342 feet, and from the report of Messrs. the Ohio Canal Commissioners, 214 feet above the mouth of Big Beaver in the Ohio; that mouth is, therefore, 127 1-2 feet above the level of Lake Erie. The rapids of Cuyahoga are from 97 to 100 feet above the Champion Swamp, and 439 to 442 feet above Lake Erie. Conneaught Lake, E. of the head of Crooked creek, is, from the level of Messrs. the Pennsylvania Canal Commissioners, 470 feet above Lake Erie.

Supposing the summit level of the canal in the Champion Swamp, it might be fed by the waters of the Cuyahoga from the rapids. Supposing it at Conneaught Lake or Pymatuning Swamp, it might be fed by the waters of French creek, derived from Meadville, as we shall see below.

The Cuyahoga, below the rapids, cannot be turned into the Champion Swamp; its valley, until it reaches nearest to the basin of the Muskingum, is divided from Mahoning Fork by a ridge, whose greatest elevation is 208 feet above the Champion. The pond which is on the portage from Cuyahoga to the Muskingum, is — feet above the Champion Swamp; — feet above Nelson's township, and about — feet above the bridge at Warren.

The quantities of water given by these streams at their lowest stage in 1824, are as follows:

	Ft. in a sec.
Big Beaver, at the Falls, and in that part only which runs through the races of the Falls, gave, from instructions received,	88.888
Shenango, above Greenville, 16th August,	28.550
Mahoning, at Warren, 6th August, [*]	46.000
Silver Creek, a fork of Mahoning, 7th August, (E. Branch Kempt Creek at Stephens' Mill, 0.664—Main Branch at Garrett's Mill, 5.406,)	6.070
Cuyahoga, at its rapids, 8th August,	56.148
Outlet of Conneaught Lake, 16th August,	6.293
French Creek, at Meadville, 17th August,	221.008
Do. do. 23d August,	229.972

NORTHERN SECTIONS.

The water courses which correspond with the heads of the Big Beaver, and fall into Lake Erie, are from west to east; Grand River, Ashtabula, and Conneaught Creek of the Lakes.

Grand River has dug for itself a bed, whose bottom is considerably lower than the general surface of the country to its east. At Bloomfield it is already 92 feet below the level of the turnpike. Its valley is deep, and its banks are very rugged, and formed of clay, without any tenacity. It offers some flats at the bends of the river, but in the intervals the banks are often perpendicular, on a height of 100 or 150 feet. At its lowest stage it has but

[*] N. B. As it was not at its lowest stage, we give only 1-2 of the result.

little water—its tributaries on the right bank are almost dried up in summer, but on the left bank, descending from a higher country, they are more permanent. When it reaches the natural dyke which borders on the Lake, Grand River, near Austinburg, runs suddenly to the west to join Lake Erie, at Fairport. Its greatest floods rise from 15 to 16 feet; in the lower part of its course they do not rise above 8 or 10 feet, and at its mouth are insignificant. By sinking two rows of piles in continuation of that mouth, a passage has been opened for the river through a sand-bar, which formerly obstructed it, and on which there was only 10 or 12 inches of water. But the piles are not closed, and an interval of 1 or 1 1-2 feet has been left between them; it would be proper to sink more piles in these intervals, especially to the W. as the reigning winds are from the S. W. and the neighbourhood is subject to squalls from the N. W. This would secure an important port on this part of the Lake. The bottom is sand and gravel, the length of the passage between the piles is from 270 to 330 yards, its breadth 138 yards. A new bar is formed at the mouth of the channel, but has 8 or 10 feet above it.

The Ashtabula offers precisely the same feature as Grand River, as to the depth of its valley, below the general surface of the country, and the rugged and perpendicular character of its banks. Conneaut Creek of the Lakes offers the same features, and, as well as Grand River, has but a small provision of water in the summer months, at least if compared to the Big Beaver, or Cuyahoga.

To the east of Conneaut Creek of the Lakes, Crooked creek, Elk creek, and Walnut creek, run successively into Lake Erie. The valleys of these streams are broad, but their banks are high, and perpendicular in the lower part of their course; they are of soft slate in layers, which, worn by the water, present a perpendicular surface. The floods of these streams rise from 7 to 8 feet.

The soil of the country between these streams, consists, in general, of a clay, very favourable for digging a canal, except at Austinburg, where we meet a ridge, which would require a deep cut; there exist no obstacles any where to its excavation, and the preparatory surveys will determine whether we ought not to prefer it to the valleys which run through it.

Conneaut lake belongs to the valley of French creek, its surface is valued at 1600 acres or thereabouts; its outlet is called Conneaut creek, and falls in French creek, 6 or 7 miles below Meadville. Its inlet rises opposite the head of Conneaut creek of the Lakes. From the surveys of the Pennsylvania Canal Commissioners, a cut 14 or 15 feet deep, and 60 or 70 yards long, would join the waters of Conneaut creek, and Conneaut of the lakes. From the head of the inlet to that of the latter stream, the distance does not pass 2 miles. The same commissioners have ascertained that a feeder, beginning at French creek, above Meadville, might, by following the western side of its valley, and then the ravine of Conneaut creek, feed Conneaut lake, if we considered it as the reservoir of a summit level. By erecting a dam wherever required, round that lake, we might obtain a vast reservoir to feed both sections of the canal.

The description which we have given of the water courses and ground on both sections of this canal, proves that we have the choice of several summit levels; Champion swamp and Conneaut Lake are the chief.

The summit ground of Champion swamp, being 342 feet, and Conneaut lake 470 feet above Lake Erie, the former has over the latter the advantage of 128 feet less in height, and of course 256 feet less of lockage. But the resources in water of the Champion swamp summit level, as we have seen above, are only 56 feet in a second, from the Cuyahoga, and 6 feet from Silver creek, total 62 feet per second.

The resources of the Conneaut summit level amount to 221 cubic feet per second from French creek, which gives it a superiority of 159 cubic feet second over the other. Reservoirs may and ought also to be found in the Cuyahoga and French creek, and a much greater depth of water can be collected, at little expense, in Conneaut lake, by running dams in certain parts of its border. Its mean depth has not been sounded.

Preparatory and comparative surveys must determine our choice between these two summit levels, and combine their several advantages with those of the several routes which may lead to them. The slender means of the Board did not allow them to begin those surveys in 1824; of course, they cannot recommend either in preference to the other, as they do not possess those exact documents, which alone can give, in a certain and positive manner, the local circumstances and details required to weigh their respective advantages and inconveniences. But the Board have already formed the conclusion, that a canal from Pittsburg to Lake Erie is not only practicable, but offers no difficulties from the nature of the soil, and will be amply provided with water for its navigation. As to the materials for its construction, stone and lime must be brought from a distance; but may be conveyed by water, by the Ohio or Lake. Brick of the best quality will be amply supplied on the spot.

We will now give a rapid review of the several routes which the canal might follow, and of the operations to perform on the ground, to determine which of them we should adopt.

First route. It may follow the right bank of the Ohio, from Pittsburg to the mouth of Big Beaver, ascend the valleys of Big Beaver, Shenango, and Pymatuning, and descend to Lake Erie at the mouth of the Ashtabula. The submit level of this route would run to the E. of Pymatuning Swamp, and be supplied by a feeder led from French creek through Conneaut Lake. It northern section would descend from the lowest spot between the sources o the Pymatuning and Ashtabula, following the most favourable ground, to the mouth of that latter stream. When it reaches Ashtabula, surveys must determine whether the canal should follow either bank of the river, or run entirely outside of the valley. In either case, all the facts relative to the establishment of a port at the mouths of the Ashtabula, in Lake Erie, must be determined. A feeder must be led from Conneaut Lake to the summit level.

The southern section of the canal, on this route, would descend, successively, the valleys Pymatuning, Shenango, and Big Beaver, to the Ohio. Levels on both sides of these valleys must determine which is most favourable. The location of the locks and dimensions of the aqueducts must be fixed, as well as those of the dams to four reservoirs, the streams destined to supply it gauged at the points where they are dammed; and the same labour must be performed on all the other routes which we shall designate.

When this route reaches the falls of Big Beaver, surveys must determine whether the directing line of the canal can be run on a height sufficient to turn round the bluff which lies to the east of its confluence in the Ohio, or even to reach Pittsburg at the close of its descent. But if the bluff opposes too many difficulties, and if it be impossible to quit the valley at a height sufficient to reach Pittsburg by successive descent of levels, instead of a section of canal descending from the Big Beaver falls to Pittsburg, we should run one descending from Pittsburg to the mouth of Big Beaver. For this purpose, running from Pittsburg up the valley of Alleghany river a line of 6 inches ascent per mile, to

the first spot where a dam might be thrown across that valley, we would form a reservoir. This line would trace the feeder which should supply the canal from Pittsburg to the mouth of the Big Beaver, and this canal run till it met the other, crossing on the right side of the Big Beaver, to avoid the bluff on its left. This arrangement would increase the total lockage of the canal as much as would be required in the descent from Pittsburg to the mouth of Big Beaver.

Second route. It might follow the same route as the former, from Pittsburg to the forks of the Mahoning and Shenango; ascend the Mahoning to Champion Swamp, where its summit level would be traced; then descend to Lake Erie, either by following the valley of Grand river, or turning to the mouth of the Ashtabula, through the townships of Bloomfield and Austenburg. The summit level of this route would be fed by the waters of the Cuyahoga and Silver creek. Its feeder, from the rapids of Cuyahoga, (two miles and a half N. W. from Judge Harman's, where a dam might be conveniently thrown across to form a reservoir,) might run to the head of Silver creek, and follow its valley to Garret's mill dam; thence, from a point five feet above this dam, be led through the most favorable ground to the summit level. If this route ended, however, in a level lower than the Champion Swamp, we should lead the feeder from a point higher than the rapids, and conduct it through the most favorable ground. The feeder should have a slope of six inches per mile.

The southern section of the Canal on this route should cross the Mahoning, near Warren, and drop its level to receive the waters of that river. A dam should be thrown across the valley at Warren, or above, to form a reservoir for the canal. Descending then the right shore of Mahoning valley to the mouth of the Chenango, means should be brought to feed it also with the watars of Musquito creek.

The northern section, if traced by the valley of Grand River, should be run above its highest floods, but kept as low as possible, consistently with this rule, to receive the waters of its tributaries. As the valley is excessively steep at the bend of Austenburg, every care must be taken to avoid its rugged banks without crossing the river too frequently on aqueducts. At the mouth of Grand River, the localities must be examined with attention to determine what can be done to form a good port on Lake Erie, at Fairport.

If this section is to be traced, running to the Ashtabula, it must pass successively through the townships of Champion, Bristol, Bloomfield, Lessingwell, Rome, Morgan, Austinburg, and Ashtabula. An experimental line may also be run from the east of Bloomfield Swamp, and another from Rome, through Jefferson, to Ashtabula. Their object will be—1st. To discover the best location for a summit level, which may be fed both by the Cuyahoga and French Creek, through Canneaut Lake. 2d. To fix the most favorable spot for crossing the ridge which runs from Ashtabula to Wrightsburg, parallel to lake Erie. To complete our investigations relative to the first of these objects, an experimental line should be run from Conneaut lake to the summit level which we have just mentioned; it should, probably, run by the head of the Chenango, Pymatuning, and Musquito Creek.

Third route. It might follow the same course as the former, to the fork of the Mohaning and Shenango, ascend the Shenango to Greenville, then Shenango creek, or Crooked creek, to reach the summit level of Conneaut lake; thence, descend to Lake Erie, directing itself on the mouth of Elk Creek. Its summit level would be fed by the waters of French creek and reservoir of Conneaut lake. The surveys should begin at a base-mark, six inches above the bottom of the outlet of that

lake, at its bridge. The summit level line should run north as far as possible, towards the ridge which divides Conneaut lake from Conneaut creek of the lake, and south to the point where it will be necessary to drop it. By this level we will measure and calculate the deep cuts which will be required through the ridges which bound north or south the basin of the lake, and judge whether the level of that line should be raised to diminish the depth of these cuts, or lowered, in order that Conneaut lake may be high enough for a reservoir; in short, it will show relatively to its southern section whether the summit level should be separated from the Lake.

Having fixed the summit level line, we should run it as far north as possible toward the valley of Conneaut creek of the lakes, and descend the right shore of that valley, on levels as long as possible, to reach Lake Erie at the mouth of Elk creek. All the localities of this spot must be examined with care, to determine what work will be necessary to form a port in the Lake.

To the south of the summit level, two routes may be tried to descend to Greenville: the one through Shenango creek, and the other through Crooked creek. From Greenville, the canal will descend Shenango creek to the mouth of Pymatuning, from whence it follows the same route as the first which we have analyzed. At this spot, bench marks should be established to compare the levels of these wo routes.

A feeder, with a slope of six inches per mile, should be traced from Conneaut lake to French creek, following the left shore of Conneaut creek and the right shore of French creek, directing itself towards Meadville. The surface of Conneaut lake, at its usual level, should be measured, and, in the supposition that its bed should be raised three, six, or nine feet higher, the level of the surrounding ground should be taken on each of these hypothesis, in order to calculate the height, length, and dimensions of the dams, which would be required, in order to confine this reservoir within the bounds which would be necessary. The elevation of the dam required to keep the waters of French creek at the elevation of the summit level, and its location below Conneaut creek, or below Little Sugar creek, will then be fixed. If this elevation below Sugar creek was moderate, it would procure on the summit level an open passage, through which the trade of Big Sugar creek, and the Alleghany, above Franklin, might pass to the canal, and form, moreover, a vast reservoir to supply all its wants.

Lastly, we should examine whether a branch might not be run from the northern extremity of the canal to Erie (Presqu'isle) either by following the banks of the Lake, or crossing Elk creek and Walnut creek.

Fourth route. From Pittsburg, it might ascend the valley of the Alleghany to Franklin, and then ascend French creek and Conneaut creek, to the summit level of the abovementioned route, following the same directions in its subsequent position.

The summit level and northern section of this route would be the same as those of the former. Its southern section, after descending the valley of French creek to Franklin, would follow that of the Allegany to Pittsburg. The two shoresof both these valleys are equally favorable for digging a canal; but, as their chief tributaries join them on the left shore, it should be preferred. On each shore there are about ten miles of rugged banks, which leave little or no room for a canal; it will be necessary, at the most difficult spots, either to run it on artificial embankments, or in the most rugged spots, to pass over from these banks to the other on aqueducts; three miles along the left shore, and four and a half along the other, present the greatest difficulties.

It will be necessary to trace a route along each bank, above the highest floods of the river, to compare them. The Big Sugar creek, the Alleghany, above Franklin, Toby's creek and the Kiskimanitas, may be formed into reservoirs to feed the canal, and these may be considered as the lowest levels of canals descending through their valleys. The feeder from these streams should be traced in the preparatory surveys, and the dams which would be required across the valley of the Alleghany should have locks, in order to leave the navigation of that river open. In these surveys, we should take in all the experimental lines for tracing the course of the canal, and those relative to its details, locks, dams, and aqueducts. The waters should every where be measured with care at their lowest stage.

The branches which this canal might receive from the East, give it in our opinion an importance, which, though its route is longer than the other which we have analized, justifies the expense of a preparatory survey. The whole valley of the Alleghany above Franklin and those of Toby's creek, Mahoning, Kiskiminatas, by which the bason of the Susquehannah may one day be united with that of the Ohio, will thus become tributary to it.

Such are the four routes which may connect the Ohio from Pittsburg, by the shortest distance and least elevation of summit level with Lake Erie.—They may all be regarded as a prolongation of the Chesapeake and Ohio canal, and as forming part of that noble line of artificial communication, which will join the vast regions of our northern Lakes with the Capital of the Republic.

Exact surveys can alone give the true length of these several routes, and the accurate height of their summit levels; the following sketch may, however, give an approximative result to compare them.

1st. Route—length, 104 miles; elevation of the summit level above Lake Erie,	450 ft.	total lockage	773 ft
2d Route, by Grand River—length 115 miles; height of the summit level above Lake Erie,	342 ft.	do	557 ft.
by Ashtabula—length, 104 miles; height of the summit level above Lake Erie,	do	do	do
3d Route—length, 113 miles; height of the summit level above Lake Erie,	470 ft.	do	803 ft.
4th Route—length, 140 miles; height of the summit level above Lake Erie,	470 ft.	total lockage,	749 ft.

And in case a section of canal should descend from Pittsburg to the north of Big Beaver on the first, second, and third routes, we should add about 64 feet to their lockage.

Before concluding this part of our report, we should give some details on other terminations proposed for the Ohio and Erie canal in Lake Erie.—One is to the west, and the other to the east of those which we have analized.

The first joins the Lake at Cleveland. For this purpose, after reaching a proper height to the north of Warren, the route ascends from Garret's mill up Silver creek, and from thence directs itself to the rapids of Cuyahoga. From thence it descends from N. E. to S. W. the valley of Cuyahoga, and directs itself N. N. W. through the same valley to Cleaveland. But besides the difficulties which it would meet in winding along this rugged valley and its rapids to Cleaveland, the total route of the canal would thus be lengthened from 24 to 30 miles, beyond what would be required if it ended at Ashtabula: and, as the rapids of Cuyahoga are from 97 to a 100 feet higher than the Champion swamp, this section would require 194 or 200 feet more of lockage than the former, without the resource of more water at its summit level.

Another direction has been suggested for this route, by embracing the northern section of Ohio and Erie canal, with the canal contemplated by the state of Ohio, to unite the Cuyahoga and the basin

of the Muskingum. The summit level of this route would be in the swamps of the southern line of Portage county, which afford the least elevation, passing between the valley of Cuyahoga, and the southern branch of Mahoning Creek. It is in township No. 1. X range. These swamps, from Mr. Benjamin Tappan, are 553 feet higher than Lake Erie, and 41 feet higher than the rapids of Cuyahoga.

To fulfil this object, the line of the Ohio and Erie canal should, from Warren, be directed thro' one of the southern branches of the Mahoning creek, to the swamps in Portage county, considered as a summit level. This, however, cannot be supplied, except from the upper Cuyahoga, whence a feeder of 35 to 40 miles in length, and requiring much extra embankments, should be traced from a point elevated 41 feet at least above the rapids.

By this direction, the northern section of the Ohio and Erie canal would be no more lengthened than in the preceding supposition, when its summit level was at the rapids; but its summit level would be 41 feet higher, and its lockage from 276 to 282 more than by the Champion swamp route. And its feeder being obliged to ascend 41 feet higher than the rapids, it is unlikely that the Cuyahoga, at such a level, would give water enough to feed the canal, on one side to Warren, and on the other to the valley of Cuyahoga, below the falls, and also to supply the lockage on the summit level.

A third direction has been suggested, with a summit level at the rapids of Cuyahoga; from thence the line would follow the right side of the valley of Cuyahoga, to a point 5 or 6 miles below, from whence it would turn to Cleaveland, leaving to its west the ravine of Tinker's creek. The practicability of this route, and its length, depend on the form and height of the soil between the Cuyahoga, below the rapids, and the head of Tinker's creek. But whatever they may be, the length of this line would be at least as great as that of the Champion Swamp route, and it would require from 194 to 200 feet more of lockage. The only advantage of terminating the canal at Cleaveland, rather than any more eastern point, would be, that its port is sooner freed from ice at the close of winter. But admiting it opened a whole month before Buffalo, and ten days before Erie, there could only be a few days difference, between the opening of Cleaveland and Fairport, or the mouths of the Ashtabula, or Elk creek. The Board is of opinion, that this advantage would not compensate for the augmentation of length and lockage which it would require, and did not, in consequence, deem it necessary to reconnoitre those sections which led the canal to to terminate at Cleaveland.

As to the direction by which it would terminate in Lake Erie, to the east of the four routes mentioned above, it begins at Franklin, on the Alleghany river, and ends at Port Erie. This section was explored and levelled by Gen. Marks, Col. Foster, and Col. Brown, Pennsylvania Canal Commissioners. From Franklin to Meadville, it follows the eastern side of the Alleghany valley, and ascends it to Lebœuf creek; it then follows Leœbuf creek valley to the Beaver dam swamp, where rise Lebœuf creek and Walnut creek, a tributary of Lake Erie, and which forms its summit level. From Beaver dam swamp it descends to Port Erie. The distance from Franklin to Port Erie, by this section of the canal, is 73 miles, of which 15 run from Beaver dam swamp to Erie. The summit level is 630 feet above Lake Erie, and would be fed by the waters of French creek, drawn from Fork point, 21 feet higher than that level. French creek, on the 23d August, 1824, gave, at this place, 43 feet 30 persecond; Lebœuf creek at Waterford, 64 feet 9 inches below the Beaver dam swamp; and at its mouth in French creek, 92 feet 9 inches below it. French, creek at Franklin, is — feet below the same level.

If we adopted this course, in continuation of the fourth route mentioned above, it would augment its length, and as Beaver dam swamp is 160 feet higher than Conneaut Lake, its total lockage would be increased 320 feet. If to this we add, that the summit level of Beaver dam swamp, would be fed by 48 cubic feet per second, whilst Conneaut Lake, in its level, could receive 221, we may conclude to reject this route for the continuation of Ohio and Erie Canal, and prefer the route by Conneaut Lake, which has equally been indicated for the canal, by Messrs. the Pennsylvania Canal Commissioners.

OHIO AND SCHUYLKILL CANAL.

(See Map No. 18.)

It is proposed to run this communication from the valley of Alleghany river, above Pittsburg, through those of the Kiskimanitas, Great and Little Connemaugh, to the west of the ridge, and Juniatti and Susquehannah to the east, to a point above Harrisburg, and from thence to Philadelphia, through the county of Lancaster.

The Board has examined this route, in co-operation with Messrs. Col. Jacob Holgate, Jas. Clarke, and Charles Tresingburgh, Pennsylvania Canal Commissioners. It would unite the Western waters with the Atlantic. The Board began by reconnitering the general features of the country through which it would pass; and the Commissioners then executed, as far as the advanced season would allow it, the levels and surveys required to ascertain the total heights of lockage, and the length of its several sections.

From Pittsburgh to the mouth of the Kiskimanitas, the valley of the Alleghany offers no difficulties in the way a canal; the river has from 9 inches to 1 foot of water at its lowest stage, and rises from 20 to 22 feet in its greatest floods at Freeport.

From the mouth of the Kiskimanitas to the forks of the Loyalhana and Connemaugh, the river presents the same depth as the Alleghany at its lowest stage, but its greatest floods do not rise above 16 or 18 feet.

The banks of the valley offer a succession of flats and bluffs; the first affording a most favorable ground for the canal, and the latter sloping so gently as to oppose no serious obstacles to it.

The Connemaugh to Blairsville, where it is joined, on its right shore, by Blacklick creek, offers precisely the same features as the Kiskimanitas, of which it is only a continuation. In descending from Johnstown to Blairsville, it flows with a more rapid course than below Blairsville, and forces its passage successively through Laurel Hill and the Chesnut ridge. The banks of these gaps offer no serious obstacles to a canal.

The gap of Laurel Hill is about 2½ miles in length, its right bank is rugged and perpendicular, but the left has a slope of 20 or 30 degrees. Some rapids are found above the gap, but on its whole length the water is deep and the current slow. The gap in Chesnut ridge is about two miles long, and is very narrow in some places; it offers two or three rapids, of which the most considerable is Richards' falls; its banks do not slope beyond them 30 or 35 degrees. The floods of the Connemaugh, at Laurel Hill gap, rise to 7 or 8 feet. Stoney creek and the Little Connemaugh join at Johnstown, and may be considered as the upper forks of the Connemaugh; the canal should proceed up the valley of the Little Connemaugh, to the point where it receives Bear Rock run. Its valley, in all that space, offering no serious obstacle to it. From Pittsburg to this point, the bottom of all these valleys is stony, and offers a firm and easy ground for the works which may be run through them. Their banks are formed of sand-stone, stratified, or in heavy blocks. Coal is abundant; and salt wells have been bored with success through the whole valley of the Connemaugh. These salt works are now in operation, and their number is multiplying very fast at the present moment.

This section from Pittsburg to the forks of the Little Connemaugh and Bear Rock run, may be considered as the western section of the contemplated canal. It will be supplied with water by the rivers whose valleys it ascends, and their tributaries. The results of the measurements which were taken in this view, in the middle of September, 1824, are as follows:

The Little Connemaugh below Bear Rock run, two miles below Selby's mill, yielded,	14.43 ft. per sec.
The Little Connemaugh at Selby's mill,	7 09
Do. at the mouth of said fork,	47.21
Do. above Johnstown,	110.73
Stoney creek above Johnstown,	239.25

Reservoirs might also be found in the valley above Selby's mill, and the head waters of South Fork and Mountain Run led to that spot by feeders.

At this point of the Little Connemaugh, the line of canal is stopped by the Alleghany mountain, which it must cross by a tunnel, to join the water courses which fall to the east. The Beaver dam, a branch of the Juniatta, offers the best route. This branch is joined by Burgoon's creek and Blair's run; whose springs are constant, and whose waters might be led by feeders to the point where the tunnel opens on the eastern side of the Alleghany mountain; the waters, which on both sides of that chain might be led to that tunnel, and supply the summit level of this canal, can give altogether by actual measurement, 40 cubic feet in a second.

The eastern section of the canal should descend the Beaver Dam, and then follow successively the Frankstown branch of the Juniatta, and the Juniatta itself, to its mouth in the Susquehannah, above Petersburg; from thence it should descend along the Susquehannah to Middletown, to direct itself afterwards, through the most favourable ground, either to the Schuylkill, above Philadelphia, or to Philadelphia itself.

The Beaver Dam joins the Frankstown branch at Frankstown; its valley, from Blair's run, is open and bordered by a large flat bottom. From Frankstown to Williamsburg, the valley offers no serious obstacle; the route then traverses Lock Mountain at Canoe Gap. From Williamsburg to Alexandria, the right shore of the river is rugged, but the left easy. The river breaks through Tussey's Mountain. At this Gap its banks are alternately flat and rugged; the flats of one side lying opposite to the bluffs of the other. Its flood seldom rises above 7 or 8 feet.

From Alexandria to Millerstown, the valley still offers no serious obstacle to a canal. Its banks consist of a succesion of flats and bluffs, whose slope is, in general, so gentle towards the river, as to oppose no difficulties in the way of the works. In this space the Juniatta receives the Raystown branch below Huntingdon and Standing Stone creek, which, at all seasons, affords an ample supply of water.—From Blair's run to Millerstown, tha left shore of this valley is, in general, most favourable; but lower down, and to its confluence in the Susquehannah, this shore of the Juniatta offers several perpendicular bluffs on the river. Seven or eight miles above Clark's Ferry, its ded begins to be crossed by banks of slaty and schistose rock, which obstruct its course. At the Great Falls, three miles above Clark's Ferry, these obstructions rise from four to fifteen feet above the bottom of the stream. The bed of the Susquehannah, to Harrisburg, is embarrassed by these schistose banks, which cross it, and belong to the ridge of Peter's mountain, through which the river forces its passage.

All the valleys which we have just mentioned, have a strong solid bottom, favourable for works of this nature; the floods of their rivers do not rise so high as in those which fall from the western side of the Alleghany, but they flow all the year, and are never dried up in the warmest seasons.

From Harrisburg, the route of the canal might proceed to Middletown, at the mouth of the Swetarra. But from thence to the Chesapeake, the banks of the Susquehannah become difficult and rugged; this consideration has led to such a passage to the Atlantic, towards the east by the Schuylkill.

To promise a sufficient supply of water for this section, and shorten its distance, it is necessary to keep as much as possible to the south of the road from Middletown to Philadelphia, by Lancaster and Downingtown; thus the line of the canal will intersect the chief tributaries of the Susquehannah below Middletown, and those of the Delaware below Philadelphia; nevertheless, as it crosses them near their heads, it is doubtful whether in the dry season they will supply water enough for an active navigation, especially if we consider that they run over a stratum of calcareous soil, which will frequently occasion considerable filtration. Particular attention should be paid, in tracing this section, to measure the springs which must feed it, and its line must be kept as low as possible to admit as many streams as the localities will allow. In any case, one tunnel will be indispensable at Gap Tavern, through the Mine ridge, which divides Octorara creek from Peguea creek; for the lowest depression of this ridge is 587 feet above the ocean, and 290 above the Susquehannah at Harrisburg.

This gap will thus be the summit level of the section of canal from Harrisburg, to the Schuylkill, and its tunnel must be kept low enough to receive a sufficient supply of water to allow the level which descends on the one side to Middletown, and on the other to the Schuylkill, to receive also their supplies; and to avoid more summit levels in this section of the route, these requisite conditions will compel to open two other tunnels on this route; the one east of the first between the heads of the Octorara and Buck-run, the other west; through the ridge which divides the little Conestago, from the Big Chickisalengo. The total length of the three tunnels which will probably be required on this section will be about 2 miles.

These important facts, relative to this section, results from the levels, performed under the direction of the Pennsylvania Commissioners, after concluding the reconnoitering tour, which we made together. We will now examine the results of the surveys, which the advanced state of the season allowed them to make on the other section of the canal; beginning by the summit level on the ridge of the Alleghany.

A profile of the Alleghany mountain has been taken, running from Selby's mill; the line of section making an angle of 81° 45′ with the maridian. By that means a point was fixed in Blairs Gap Run, a branch of the Beaver-dam, on a level with Selby's Mill. The horizontal ditance between them, was found to be 4 miles 698 yards. If a tunnel was run in this direction and on this level, with deep cuts at both extremities and to the depth of 35 feet, it would have nearly 4 miles in length, its bed would be 754 feet below the summit of the mountain, 1831 feet above the ocean, and 1,075 feet above the Ohio at Pittsburg. By raising the level of this tunnel, its length would be diminished, but it would augment the lockage and be supplied with less water. By lowering it, it would have more water and less lockage, but its length would be augmented. Accurate and detailed estimates can alone enable us to compare the expense of a foot of tunnelling with that of a foot of lockage, &c. But for our present object, we will merely state that a tunnel of 4 miles in length is the shortest which in this part of the Alleghany can unite its eastern and western waters; and that, by lowering it 70 feet, which would diminish its lockage 140 feet, and augment its length about 1 mile, it is probable that

the summit level might be abundantly supplied by the constant flowing springs of its eastern and western streams, formed into reservoirs. We will add that the summit of Alleghany is, from the preceding data, 2,585 feet high at the spot where the profile was taken.

As to the other sections of the canal, the surveys and levels gave the following results for the total amount of their lengths and lockage.

From Pittsburg to the western extremity of its summit level, tunnel length,	112 miles,	ascent	1,075 feet.
Length of summit level tunnel,	4 "		
From its eastern extremity to Middletowo,	153 "	descent	1,608
From Middletown to the Schuylkill,	110 "	as. & des.	675
	379		3,358

We have not examined the line of canal which might lead from Harrisburg to the mouth of the Susquehannah; it did not enter into the operations which we performed in co-operation with the Pennsylvania Canal Commissioners. From the levels run, in 1823, for the state of Maryland, by Captain Hartman Bache, United States' Topographical Engineer, and Lieutenants Eakin, Graham, and Boyce, of the United States' Artillery, and the surveys directed by Mr. Geddes, a canal, descending from York-Haven to Havre-de-Grace, at the mouth of the Susquehannah, would require 272 feet lockage, on 55¾ miles in length. If led to Harrisburg, its total length would be 62 miles, and its lockage 297 feet at most, as Harrisburg is 297 feet above tide water. This line would have over that from Middletown to the Schuylkill, the following advantages: 48 miles less in length to reach tide water; about 378 feet less of lockage; a more plentiful supply of water, and the saving of about two miles of tunnelling. But to these advantages are opposed the difficulties and obstacles which the ground opposes to the construction of a canal in the Valley of the Susquehannah, from Middletown to Havre-de-Grace: surveys, accurate gauging of the waters, and regular estimates, can only afford elements necessary to decide this question.

In any case, overlooking the consideration of expense, in an object so important as that of uniting the waters of the West with the Atlantic, we see that nature, on the route we have just described, has probably given the means or possibility of joing the Ohio to the Ocean. Reservoirs judiciously formed the in heads of the Conemaugh and Juniatta, might secure a sufficient supply of water to the summit level, and a section of the canal, descending the Valley of the Susquehannah, from Middletown to Havre-de-Grace, might be substituted to that which runs from Middletown to the Schuylkill, if the latter was found more expensive, insufficiently supplied with water, and longer.—The comparison of these two routes, and the examination of the summit level, at the heads of the Conemaugh, are the parts of this work which require to be studied with the most scrupulous exactness, before coming to any conclusion.

DELAWARE AND RARITON CANAL.

This interesting route was examined by the Board, in co-operation with Messrs. the Hon. G. Holcombe, L. Z. C. Elmer, and Peter Kean, New-Jersey Canal Commissioners. A level was run on the ground, in 1816, by Mr. John Randal, jun. under the direction of Messrs. John Rutherford, John W. Simpson, and G. Holcombe, then Canal Commissioners of New-Jersey. This is the line which we reconnoitred.

Commencing above Lamberton, it directs itself, deviating little from straight line, to the Rariton, between New-Brunswick and Washington. Its length is about 29 miles. Supposing the canal 8 feet deep, and its bottom 60 91-100 feet above the medium of high and low water in the Rariton, and 58 86-100

feet above the medium of high and low water in the Delaware, its line of water would not deviate much from the actual surface of the soil in the greatest part of its length. In some spots, however, embankments would be necessary to raise it; in others, cutting through the undulations of the ground; but the former would seldom exceed from 1 to 12 feet in length; the others from 5 to 20 in depth, and they will only be required for short distances. Many of them may be avoided in finally locating the route of the canal.

This work will thus run on one level, offering, at each extremity, a series of locks to descend, on one side, into the Rariton, and, on the other, into the Delaware. But, before examining its terminations, we should trace the intermediate route between those extreme points.

Crossing, successively, the Assunpick and Millstone, it descends the valley of Lawrence brook.—From the Assunpick to Millstone river, it crosses the ground which divides the waters of the Raritan rom those of the Delaware. Although it is lower than the ground between Millstone river and the head of Lawrence brook, at Longbridge Farm, it joins the valley of that brook and descends it, turning round the foot of Sandyhill, and crossing from its right to its left shore, follows it nearly to the spot where it is crossed by the road from Washington to New-Brunswick.

The terminations of this canal were not yet fixed upon at the period of our co-operation with the Commissioners. If it is to be 8 feet deep, and navigable for sea vessels, its eastern termination should join the Raritan, if possible, below the obstructions which, at low water, impede its navigation for ships drawing more than 8 feet: for this purpose it should run eastwardly, and by the most favourable ground, to reach a spot, on the right shore of the Rariton, below which it may present, through its whole channel, from eight to nine feet of water at low tide. It will, perhaps, be necessary to depart, in consequence, from the line which we have indicated, south of the head of Lawrence brook, and turn, more eastwardly, towards South river.

As to the termination of the canal in the Delaware, that river is obstructed below Trenton, by shifting banks, which are covered by only 2 1-2 feet at low water. These obstacles extend to Bordentown, and are formed by the deposite of the waters at the meeting of the rising tide and descending course of the Delaware. It is not probable that they can be remedied by any works performed in the bed of the river. This circumstance will compel to descend from the heights of Lamberton into the valley of Conwick's creek, to join the Delaware at Bordentown; and, as this creek presents a bar at its mouth, it will require a dredging machine to keep its channel open. From the point where the canal joins Conwick's creek, to Bordentown, the right side of its valley is perpendicular, and 60 or 70 feet high. Its left shore is a meadow, whose surface is higher than the waters of the Delaware, and is never flooded by the ice which the Delaware drives down in the winter. The canal might be run along this prairie, during this part of its course; and the widening of the creek at its mouth, would afford, in every season, a safe harbor for the boats and vessels navigating the canal. As to the nature of the soil, it consists, generally, of a mixture of light sand and stony gravel, and will compel, not only to give a great slope to the sides of the canal, but to puddle both them and the bottom, in order to diminish its leakage and filtration, especially where the line of the canal will require it to be raised above the natural soil. Independently of the water required for its lockage, on a route so frequented as that between the Delaware and Raritan, this soil will also render a large supply necessary, to provide for losses from filtrations and evaporation.

The heads of the Assunpick, Millstone, and Lawrence brooks, will certainly furnish a great deal, amounting, from the measurement taken in 1816, by Mr. M. J. Randal, jr. to 8,234,444 cubic yards a month; but it is not stated if they were taken at the lowest stage of those streams. If so, this quantity would be sufficient for a canal 60 feet wide at its upper surface, 30 at bottom, and 8 feet deep, on 30 or 40 miles of length. But, to ascertain, so as leave no doubt on the subject, the exact quantity which those streams can supply, is an indispensable preliminary operation to decide whether it will not be necessary to have recourse to the waters of the Delaware in order to feed the canal—and supposing it was not found necessary, we should still compare, *on the other side*, the expense of purchasing the mill sites of these rivers, and the loss which their suppression would occasion; and, *on the other side*, the cost of a navigable feeder descending from the Delaware, balanced with the advantages which it would add to the revenue of the canal.

If this feeder began at the rapids of the Delaware, above Tumbling Dam, that river might supply the canal with all the water which it required. This spot is 90 feet above the level of the stream at Trenton from Judge Gordon's levels, and 28 or 29 feet above the line of water of the canal; the localities are favourable for the construction of a wing-dam, and the navigable feeder would run for 25 or 30 miles in length, through a ground which would oppose no serious obstacle to its course. Supposing the canal terminated in the valley of Conwick's creek, this feeder might supply a branch, opening a communication between Trenton and the canal. It is needless to add, that, as it would enter the canal at its western extremity, it would be necessary to give to the bottom of that canal a slope from west to east, sufficient to make its waters flow freely at the end opposite to that which receives the feeder.

As to the dimensions of the canal, we have supposed that its depth would be at least 8 feet, and that it should be navigable for bay vessels—otherwise, the noble line of interior navigation running parallel to the coast, and which is contemplated from Georgia to Massachusetts, would here be interrupted. In a national point of view, it is therefore very desirable, that the Delaware and Raritan Canal, which, besides, communicates between two such cities as New-York and Philadelphia, should receive the same profile adopted for the Chesapeake and Delaware Canal, by the high-spirited gentlemen engaged now in that great work [1.]

BARNSTABLE AND HYANNIS HARBOR CANAL.

The northern termination of this canal opens in Barnstable harbor, and its southern termination in Hyannis harbor. Its object is to provide a passage through the isthmus of Cape Cod, in order that the coasting trade may avoid doubling that Cape.

The two issues of this canal are the only favourable points about it; the intermediate ground is entirely unfit for such a work. The harbor of Barnstable is well sheltered; its channel near the entry of the port, is intercepted by a bar, which has, at the ebb of the tide, but five or six feet of water, but, in the interior of the port it offers an excellent anchorage. The tide rises here about ten feet.—Hyanni's harbor is an open road, with two or three fathoms of water at low tides; but has an anchorage where vessels can be secured against any wind. In winter, it is easily disencumbered from ice.

The line of canal which should join these two ports, would be only five or six miles long, but there is no valley in that space to receive it, and it should be one deep cut from one end to the other. The

[1] This canal will be 60 feet wide at the water's line, 36 at the bottom, 8 feet deep, 14 miles long, and is lined with stone.

lowest part of the ridge which it should cross, is at sight 80 feet at least above low tides. It is true, that between the hills which form this ridge, lie a chain of ponds in the direction which the canal should follow; which might suggest the idea of uniting them by deep cuts, and making them a part of the canal. But they would not give the water required for its navigation; they appear to be filled by rains and snows rather than by springs, and what confirms this hypothesis, is, that, a cut having been made from one of them, to establish a mill at this artificial outlet, its surface immediately sunk to the level of its bottom, and never rose since. And, as besides, each of them only receives the waters of a small surface of ground, they cannot be considered as reservoirs sufficient for the object in view; the highest of them could never feed a summit level.

From these motives, and from the evident inferiority of this line to a more western one, which we are going to describe, we are of opinion that it ought to be given up.

BUZZARD'S BAY AND BARNSTABLE CANAL.

A canal to communicate between Buzzard's and Barnstable bay, should follow successively from W. to E. the valleys of Monument and Scusset rivers. That route was surveyed in 1818, by Mr. L. Baldwin, at the individual expense of Messrs. Israel Thorndike, Thomas Perkins, and other gentlemen of Boston. Its total length is about eight miles. (See map No. 19.)

At its western extremity, the tide rises in Buzzard's bay, from five feet to five feet three inches. At its eastern extremity, it rises in Barnstable bay, from ten feet, to ten feet four inches, and three hours and a half later than in the other. Thus the medium of tide water in Barnstable bay, is probably about on a level with high tide water in Buzzard's bay; the level of low water in the latter, was, on the 11th of September, 1818, 8 6-10th inches higher than in Barnstable bay.

As the tide ascends three or four miles in Monument river, and about two miles in Scusset river, this route extends only two or three miles from the head of one tide to the head of the other. The highest point of the intervening ground is 33 1-2 feet above low water in Barnstable bay, and 23 1-2 above high tide. Thus, nature has left little to do to unite the two bays. We shall trace, in a general manner, the route which the canal might follow.

Departing from Back river harbour at the mouth of Back river, in Buzzard's bay, it might run through the most favourable ground to Monument river, and enter its valley about 3-4 of a mile above its mouth. Then following that valley to the mouth of Herring pond brook, it might cross the ground which divides the heads of the Monument from those of the Scusset, to descend the valley of the latter to Swift's mill. From thence, it might either follow the left shore of the Scusset river, and enter Barnstable bay by prolonging, in a northern direction, the foot of a bank which lies to the west of the Salt marshes, through which the Scusset winds, before it falls into the bay. Or it might follow the right shore of the Scusset river and cross the Plymouth neck at its lowest point, and turning to the east, round it, enter the bay in a N. N. E. direction.—This second route would be shortest, but the other would be susceptible of better defence in time of war; be more protected at its south against the N. W. winds, and lead to a part of the bay of a more convenient and adequate depth for shipping.

The ground, through which runs this route, offers on its surface, a sandy soil, embedding rocks, loose stones, and gravel; it is probable that, in digging it to the depth required for the bottom of the canal, we would meet with no great difficulties, but this point can only be decided with certainty by sinking shafts in it.

As to the harbours where the canal would end in both bays, its western extremities would join Back river harbour. Sea vessels, drawing no more than eight feet, can enter this port. Crossing, at low tide, between Bird's island and Wing's neck, they might run to the east of this neck, into a channel from 20 to 22 feet deep, then, directing themselves upon Back river, they would pass a shoal which offers above eight feet of water, and, as they approach Back river, deepens from 13 to 20 feet. Back river harbour might be easily defended in time of war, by batteries raised in Hog's and Marshner's islands, which are near enough for this purpose, to one another and to the main. At low water, the pass between Hog's Island, and the main, is three fathoms deep; that between Hog's and Marshner's islands is fordable, and that between Marshner's island and the main, has about 8 fathoms in depth. These islands form, with the main, a road exposed to the N. W. winds, as the coast, to its west, is too low and distant to shelter it. Besides the outer harbor of Back river, an inner harbour might easily be formed in the river itself, in laying out and constructing the works of the canal.

At the eastern extremity of the canal, the harbor of Barnstable bay offers three fathoms of water, at a short distance from the shore. The bank to its west, of which we have spoken above, shields it from N. W. winds, but it remains much exposed to those from north to east round by the west: for the isthmus of Cape Cod is too low and distant to shelter it. A jetee would be required to fulfil this object, and the materials to erect it would be found on the shore itself. An inner harbor could easily be dug in the salt marshes through which the canal runs before its termination.

We have only now to determine whether this canal should be built with a summit and inferior levels, or be all constructed on one level, and fed by the tide.

The only stream which could feed its summit level, would be the outlet of Herring pond, 32 feet above high tide in Buzzard's bay. It yielded, on the 30th of October, 1824, 9½ cubic feet per second, and it had rained during the preceding days. This quantity would not suffice even for one half of the minimum of its lockage, if the locks admit sea vessels. Of course we have no choice. The canal must extend on one level from one bay to the other, be fed by the tide of Barnstable bay, and provided with a tide-lock and port at each of its extremities. Its bottom will be, at least, 8½ feet below the neap tides, or 9½ below the common tides in this bay. It is needless to add, that its dimensions should be adapted to sea vessels.

This short analysis proves that the practicability of the Buzzard's bay and Barnstable canal does not admit of a doubt, and that its construction will meet with no serious obstacle. The expense will not be great, if we compare it with that of the Delaware and Chesapeake canal, which extends fourteen miles in length, and requires a deep cup of three miles, through a ridge which rises 84 feet above tide water, and 76 feet above its summit level. The maximum cost of this last canal has been valued at $1,354,364.

The Board have not examined the navigable character of Buzzard's bay, as the season was too advanced to perform this task in a satisfactory manner. The following information has, however, been procured with respect to it:

The northwest winds, which reign chiefly during the winter and autumn, are favorable to ascend the bay, as well as the southwest winds, which reign chiefly during the summer. Its shores offer several anchorages; and the rocks which are found amongst them, may be marked, in order that the coasters may avoid them. They may pilot themselves into the bay. It is not affected by fogs more than the Vineyard sound. In its lower parts the tide rises 2 1-2 knots in an hour—on the shoals, 4 knots. In the winter, the ice formed on the northern shore, when thawed by the southwest winds, is driven to the opposite shore, when the northwest blows. In consequence, this bay is, therefore, longer obstructed by floating ice than the Vineyard sound.

As to the canal itself, it would freeze during 2 1-2 months, at most, and six weeks, at least; but this inconvenience is in some measure diminished, as the port of Boston is frequently inaccessible during two or three weeks in the winter, from the same cause.

Buzzard's and Barnstable canal is the eastern link of the great line of internal communication along our Atlantic frontier, which is destined to connect all its ports, from Georgia to Massachusetts.

But, it cannot be denied, that, in time of war, the passage from Long Island Sound to Buzzard's Bay, is much exposed to be annoyed, or even totally intercepted, by cruizers stationed in the anchorage of Gardiner's Bay. This section of our maritime frontier will thus require, at such a period, a constant naval force for its protection. A naval force will also be required in Barnstable Bay, to secure the communication between the mouth of the canal and Boston Bay.

TAUNTON AND WEYMOUTH CANAL.

This canal will open to the south in Mt. Hope Bay, a branch of Narragansett Bay; and to the north in Boston Bay. Beginning at Weymouth landing, its route would meet the Taunton at Williams' landing place, passing through the township of Abington, Bridgewater, and Raynham. Its total length will be 26 miles, and its summit ground, at Howard's meadow, in Bridgewater town, is 132 feet 10 inches above the highest tides.

This route was explored and surveyed by a committee appointed in March, 1806, by a resolution of the Legislature of Massachusetts, consisting of Messrs. Williams, Taylor, and Eliphalet. The Board received also, on the ground itself, exact documents on the contemplated canal, from Mr. Minot Thayer.

Weymouth Great pond, in Weymouth town, and Cranberry pond, (in Braintree) are considered as reservoirs, destined to feed the summit level of this canal. Weymouth Great pond has an area of 507 1-10 acres; its depth varies from 10 to 18 feet; its surface is 147 feet 5 inches above high tides, and 14 feet 7 inches above the summit level. Cranberry pond is 160 feet 9 inches above tide water, 27 feet 11 inches above the summit level, and 13 feet 4 inches above Weymouth Great pond.

The outlet of the former gave, on the 5th o November, 1824, 2⅜ cubic feet per second, and Cranberry pond gave 1½ feet—total 3 5-6 cubic feet per second. These two ponds cannot, between them, feed a summit level. Of course, its line of water cannot be raised to the level of the lowest, and it will be necessary to drop it sufficiently to receive some other supplies of water.

Braintree town offers two other ponds on a lower level. They are called Great and Little pond. The former has an area of about 500 acres; its surface is 109 feet 5 inches above tide water, and thus, 23 feet 5 inches below the summit ground. It gave, on the 1st of November, 25 1-3 cubic feet. This quantity, added to 3 5-6 cubic feet, would amount to 29 1-6 cubic feet, and prove barely sufficient for the expense of lockage, which a canal of ordinary dimensions would require, leaving no supply to repair its losses from filtration and evaporation. In the winter, the water of the ponds might indeed be preserved and accumulated by dams, and provide a supply for the opening of navigation. But further investigation can alone decide to what

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